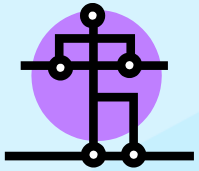
North Carolina Immunization Conference
31 July 2013

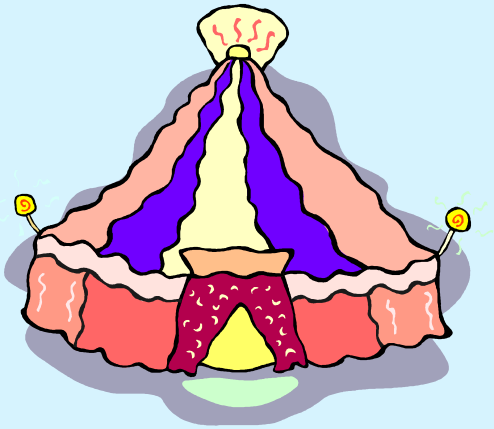
The Impact of Vaccines



Jessie S. Wing, MD, MPH
Deputy Director
CAPT, USPHS
Immunization Services Division
US Centers for Disease Control and Prevention
Atlanta, GA

Outline

- The Impact of Vaccines
- International and US examples
- US programs
- Challenges
  - *Childhood – OIG Report*
  - *Adolescence – HPV coverage*
  - *Adult – low coverage*
- Modernization efforts
- Change is ahead

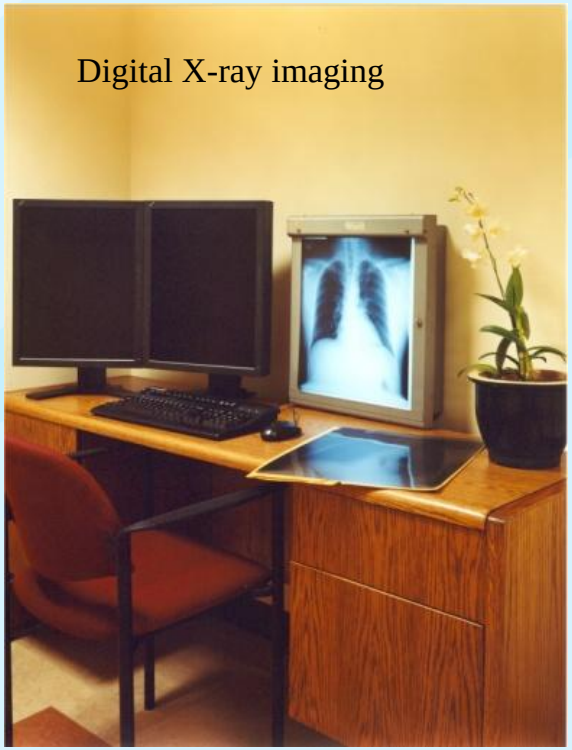



2013: 51th anniversary of the 317 Program in the US

TB Control in Hawaii, 1900's

--NO VACCINE… no antibiotics…

Evolution: TB Control in Hawaii



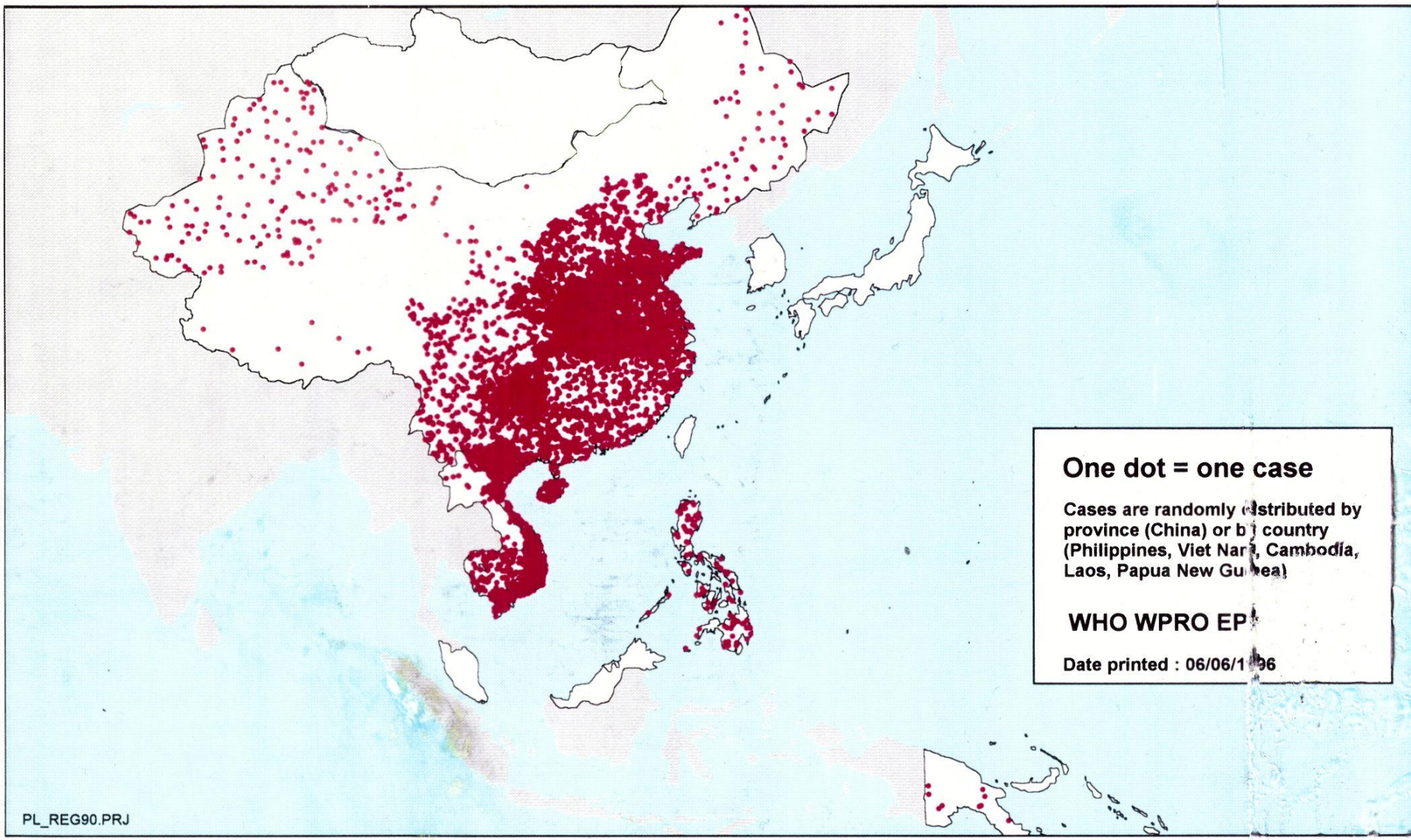
2003 Lanakila Tuberculosis Clinic

State-of-the-art facility

THE IMPACT OF VACCINES…
…DISEASE IS BAD!

Western Pacific Region polio cases, 1990

Data from acute flaccid paralysis surveillance system



Polio Vaccine is effective!

1995:
1 imported case of polio

How?
1- National Immunization Days- 80M children vaccinated with OPV
2- Political support
3- Effective vaccine

US IMMUNIZATION PROGRAMS

Jet-injected Salk Vaccine (POL_{IPV}) Mass Campaigns, 1950s

Courtesy: B Weniger

MEASLES

RUBELLA

POLIO

VARICELLA

HAEMOPHILUS INFLUENZAE TYPE B

MENINGOCOCCEMIA

MUMPS

DIPHTHERIA

Comparison of 20th Century Annual Morbidity and Current Morbidity: Vaccine-Preventable Diseases

Disease	20th Century Annual Morbidity†	2012 Reported Cases ††	Percent Decrease
Smallpox	29,005	0	100%
Diphtheria	21,053	1	> 99%
Measles	530,217	55	> 99%
Mumps	162,344	199	> 99%
Pertussis	200,752	41,880	79%
Polio (paralytic)	16,316	0	100%
Rubella	47,745	8	> 99%
Congenital Rubella Syndrome	152	2	99%
Tetanus	580	36	94%
Haemophilus influenzae	20,000	21*	> 99%

†Source: JAMA. 2007;298(18):2155-2163

†† Source: CDC. MMWR January 4, 2013;61(52);ND-719-ND-731. (provisional week 52 data)

* *Haemophilus influenzae* type b (Hib) < 5 years of age. An additional 14 cases of Hib are estimated to have occurred among the 227 reports of Hi (< 5 years of age) with unknown serotype.

Comparison of Pre-Vaccine Era Estimated Annual Morbidity with Current Estimate: Vaccine-Preventable Diseases

Disease	Pre-Vaccine Era Annual Estimate	2010 Estimate (unless otherwise specified)	Percent Decrease
Hepatitis A	117,333 †	*7,138*	*94%*
Hepatitis B (acute)	66,232 †	*9,428*	*86%*
Pneumococcus (invasive)			
all ages	63,067 †	39,500 #	37%
< 5 years of age	16,069 †	4,400##	73%
Rotavirus (hospitalizations, < 3 years of age)	62,500 ††	16,250###	74%
Varicella	4,085,120 †	*281,873*	*93%*

† Source: JAMA. 2007;298(18):2155-2163
†† Source: CDC. MMWR. February 6, 2009 / 58(RR02);1-25
# Source: CDC. Active Bacterial Core surveillance Provisional Report; *S. pneumoniae* 2010. http://www.cdc.gov/abcs/reports-findings/survreports/spneu09.htmll
Source: 2010 (provisional) Active Bacterial Core surveillance
Source: New Vaccine Surveillance Network 2011 data (unpublished)

DISEASE IS BAD...
AND VACCINE IS GOOD...!

US IMMUNIZATION PROGRAMS

...COMPLEXITIES OF OUR WORK...

Number of Vaccines in the Routine Childhood and Adolescent Immunization Schedule

1985

Measles
Rubella
Mumps
Diphtheria
Tetanus
Pertussis
Polio

7

1994

Measles
Rubella
Mumps
Diphtheria
Tetanus
Pertussis
Polio
Hib (infant)
HepB

9

2011

Measles
Rubella
Mumps
Diphtheria
Tetanus
Pertussis
Polio
Hib (infant)
HepB
Varicella
Pneumococcal disease
Influenza
Meningococcal disease
HepA
Rotavirus
HPV

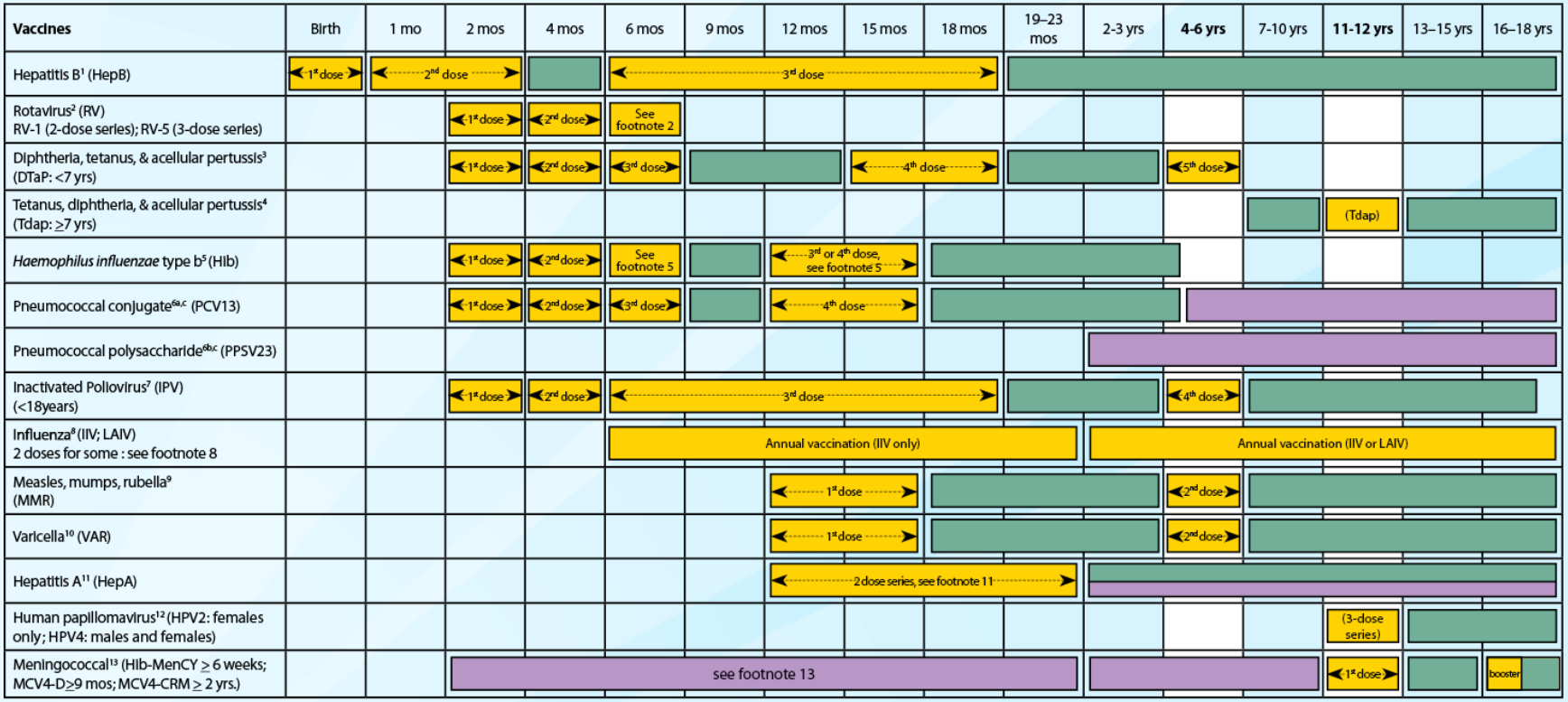
16

2013 ACIP Schedule for 0-18 y/o

Figure 1. Recommended immunization schedule for persons aged 0 through 18 years – 2013.

(FOR THOSE WHO FALL BEHIND OR START LATE, SEE THE CATCH-UP SCHEDULE [FIGURE 2]).

These recommendations must be read with the footnotes that follow. For those who fall behind or start late, provide catch-up vaccination at the earliest opportunity as indicated by the green bars in Figure 1. To determine minimum intervals between doses, see the catch-up schedule (Figure 2). School entry and adolescent vaccine age groups are in bold.

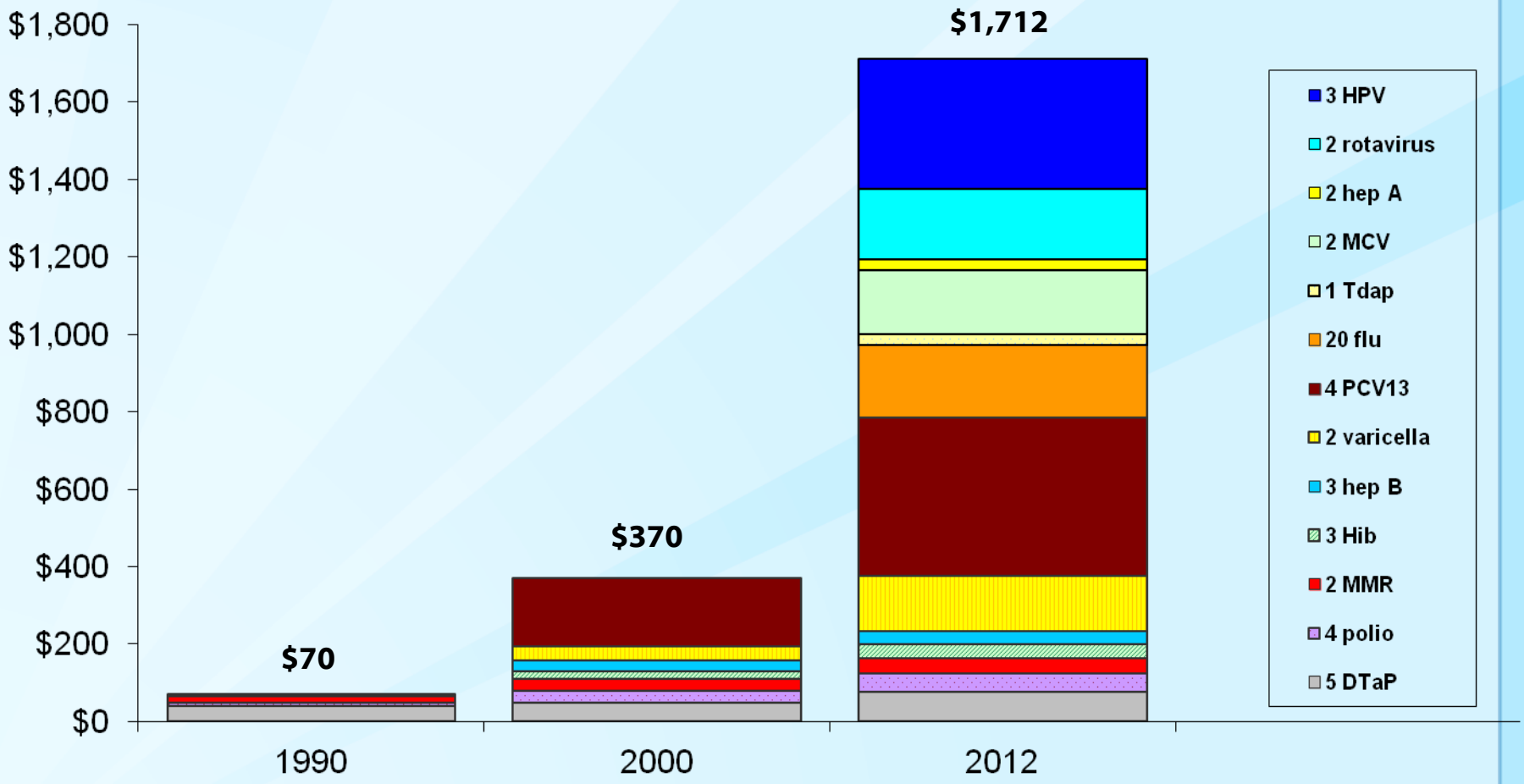


This schedule includes recommendations in effect as of January 1, 2013. Any dose not administered at the recommended age should be administered at a subsequent visit, when indicated and feasible. The use of a combination vaccine generally is preferred over separate injections of its equivalent component vaccines. Vaccination providers should consult the relevant Advisory Committee on Immunization Practices (ACIP) statement for detailed recommendations, available online at http://www.cdc.gov/vaccines/pubs/acip-list.htm. Clinically significant adverse events that follow vaccination should be reported to the Vaccine Adverse Event Reporting System (VAERS) online (http://www.vaers.hhs.gov) or by telephone (800-822-7967).Suspected cases of vaccine-preventable diseases should be reported to the state or local health department. Additional information, including precautions and contraindications for vaccination, is available from CDC online (http://www.cdc.gov/vaccines) or by telephone (800-CDC-INFO [800-232-4636]).

This schedule is approved by the Advisory Committee on Immunization Practices (http://www.cdc.gov/vaccines/acip/index.html), the American Academy of Pediatrics (http://www.aap.org), the American Academy of Family Physicians (http://www.aafp.org), and the American College of Obstetricians and Gynecologists (http://www.acog.org).

NOTE: The above recommendations must be read along with the footnotes of this schedule.

Cost to Vaccinate One Child with Vaccines Universally Recommended from Birth Through 18 Years of Age: 1990, 2000, and 2012



2012 represents minimum cost to vaccinate a child (birth through 18); exceptions are 1) no preservative influenza vaccine, which is included for children 6-47 months of age, and 2) HPV for males and females.

Federal contract prices as of February 1, 1990, September 27, 2000, and April 24, 2012.

ARTICLE

Economic Evaluation of the 7-Vaccine Routine Childhood Immunization Schedule in the United States, 2001

Fangjun Zhou, PhD; Jeanne Santoli, MD, MPH; Mark L. Messonnier, PhD; Hussain R. Yusuf, MBBS, MPH; Abigail Shefer, MD; Susan Y. Chu, PhD, MSPH; Lance Rodewald, MD; Rafael Harpaz, MD, MPH

Objective: To evaluate the economic impact of the routine US childhood immunization schedule: diphtheria and tetanus toxoids and acellular pertussis; tetanus and diphtheria toxoids; *Haemophilus influenzae* type b conjugate; inactivated poliovirus; measles, mumps, and rubella; hepatitis B; and varicella vaccines.

Design: Decision tree–based analysis was conducted using population-based vaccination coverage, published vaccine efficacies, historical data on disease incidence before vaccination, and disease incidence reported for 1995-2001. Costs were estimated using the direct cost and societal (direct and indirect costs) perspectives. Program costs included vaccine, administration, vaccine-associated adverse events, and parent travel and time lost. All costs were

Main Outcome Measures: Net present value (net savings) and benefit-cost ratios of routine immunization.

Results: Routine childhood immunization with the 7 vaccines was cost saving from the direct cost and societal perspectives, with net savings of $9.9 billion and $43.3 billion, respectively. Without routine vaccination, direct and societal costs of diphtheria, tetanus, pertussis, *H influenzae* type b, poliomyelitis, measles, mumps, rubella, congenital rubella syndrome, hepatitis B, and varicella would be $12.3 billion and $46.6 billion, respectively. Direct and societal costs for the vaccination program were an estimated $2.3 billion and $2.8 billion, respectively. Direct and societal benefit-cost ratios for routine childhood vaccination were 5.3 and 16.5, respectively

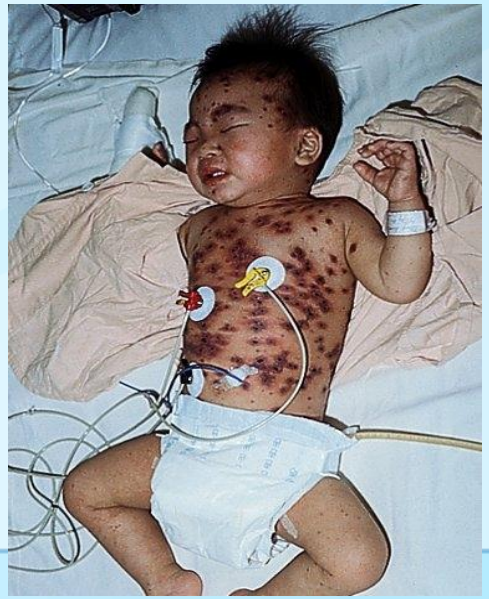
Archives of Pediatrics and Adolescent Medicine 2005

Value of U.S. 0 to 6 Years Immunization Schedule: Vaccinating One Birth Cohort

Benefit:Cost Ratio

3.0 direct medical

10.2 societal



Prevents

42,000 deaths

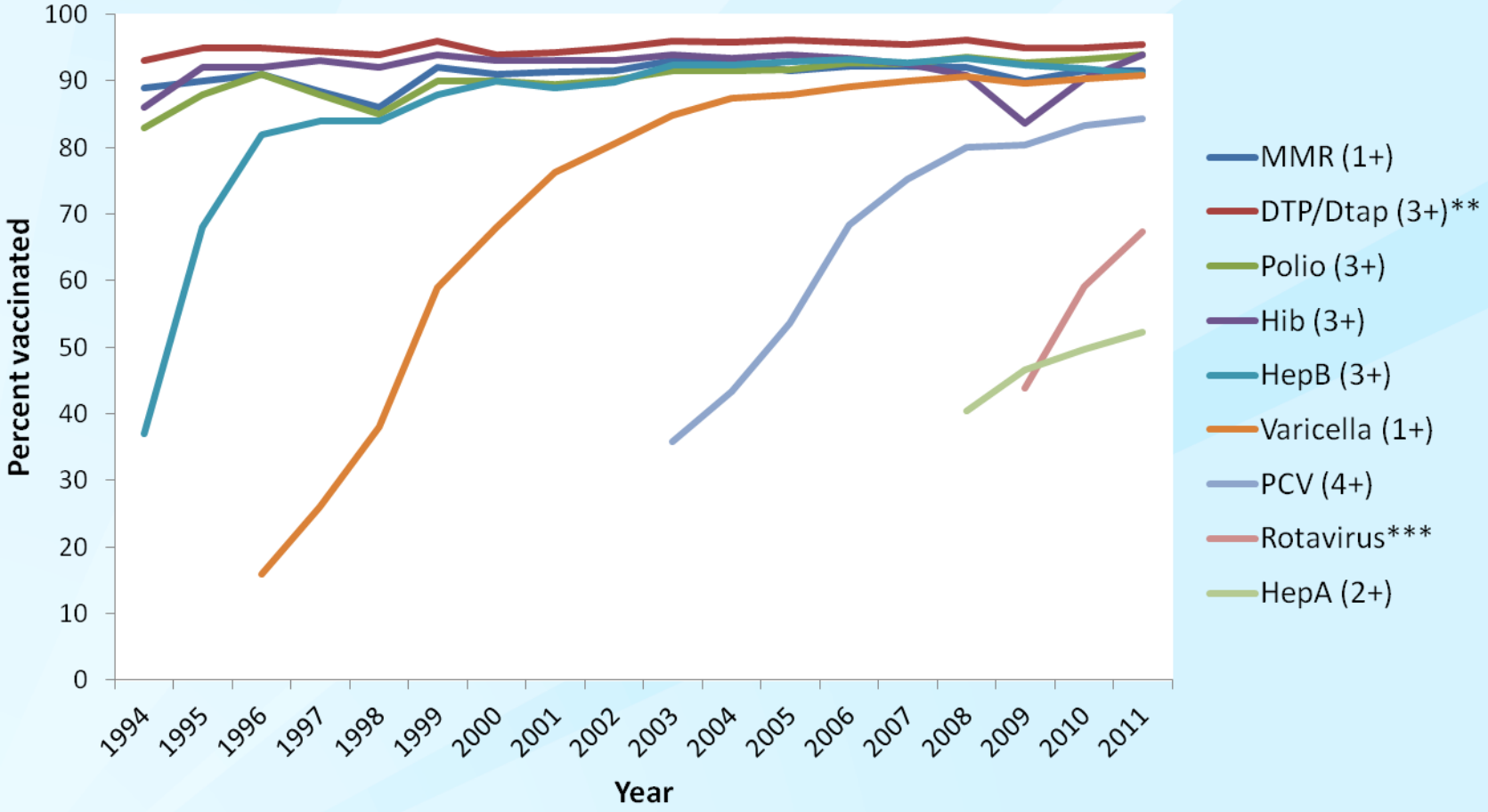
20 million cases

THE IMPACT OF VACCINES...
→ VACCINE IS GOOD!

VACCINE COVERAGE DATA
19-35 MONTH OLD CHILDREN

Vaccine-specific coverage* among children 19-35 months, National Immunization Survey, 1994-2011

DRAFT



** The Healthy People 2020 target for coverage is 90% for all vaccines with the exception of rotavirus (80%) and HepA (60%).*

† DTP (3+) is not a Healthy People 2020 objective. DTaP (4+) is used to assess Healthy People 2020 objectives.

Children's public- and private-sector partnership

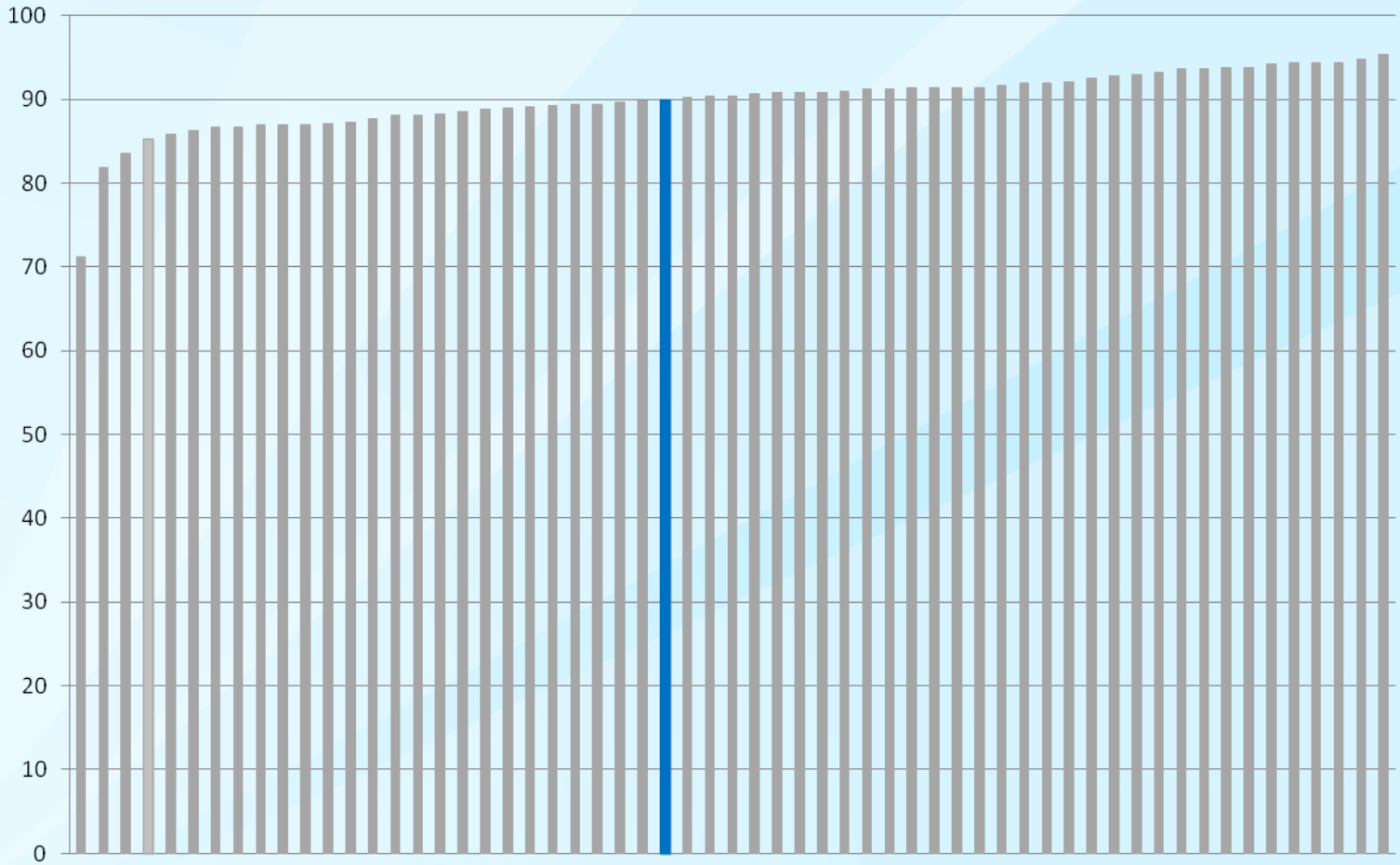
VACCINES FOR CHILDREN PROGRAM

Status of US Immunization Programs

- *Most vaccine-preventable diseases at record lows*
- *Achieved and sustained high childhood immunization*
- *Reduced racial, ethnic, economic disparities in childhood coverage*
- *Introduced multiple new antigens*
- *Improved influenza vaccine supply*
- *Global Polio Eradication Initiative*

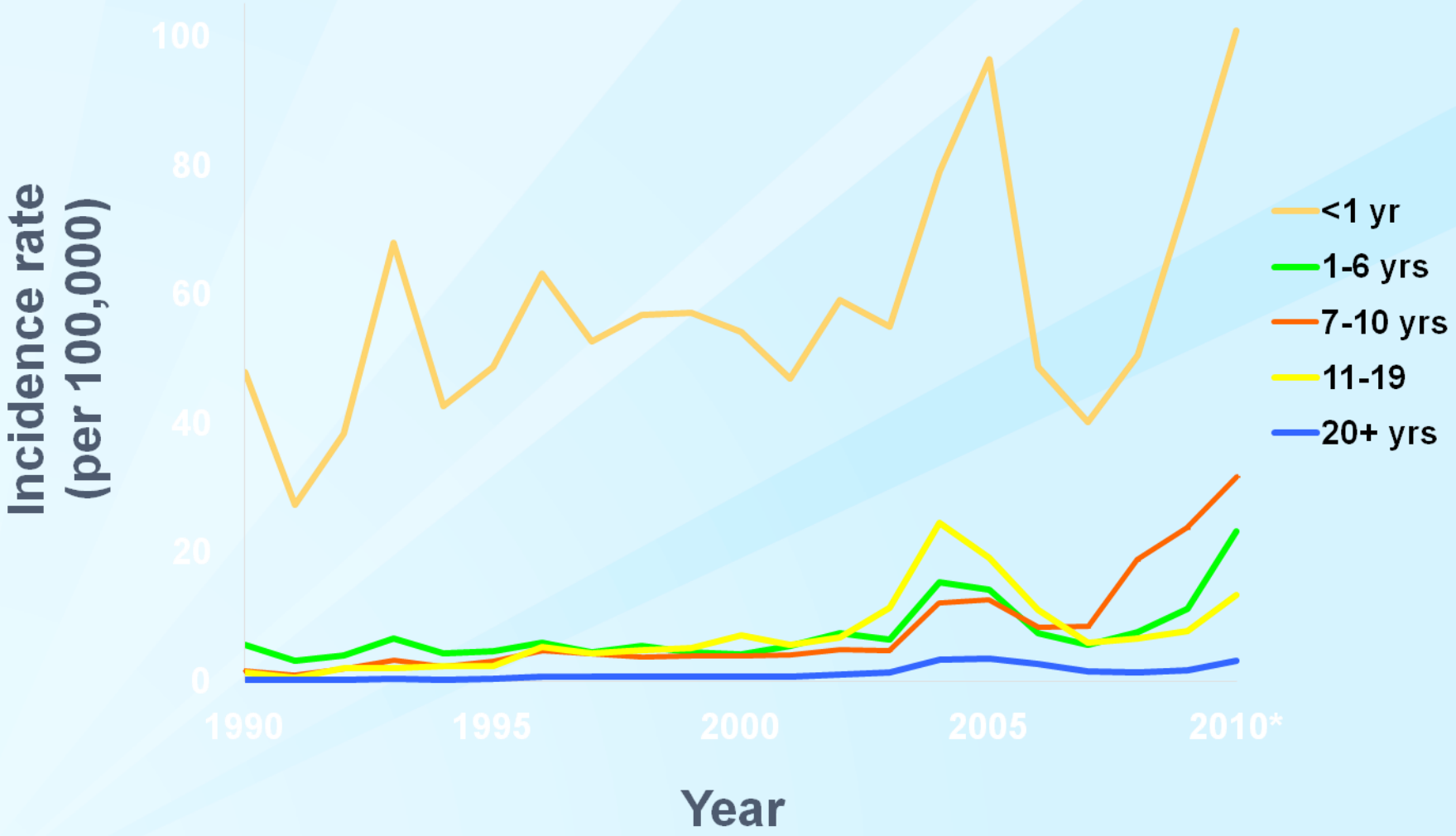
CHALLENGES

MMR Coverage Levels by State, 19-35 Months of Age; NIS 2011



U.S. National Average: **Blue**

Reported pertussis incidence by age group — 1990–2010



SOURCE: CDC, National Notifiable Diseases Surveillance System and Supplemental Pertussis Surveillance System

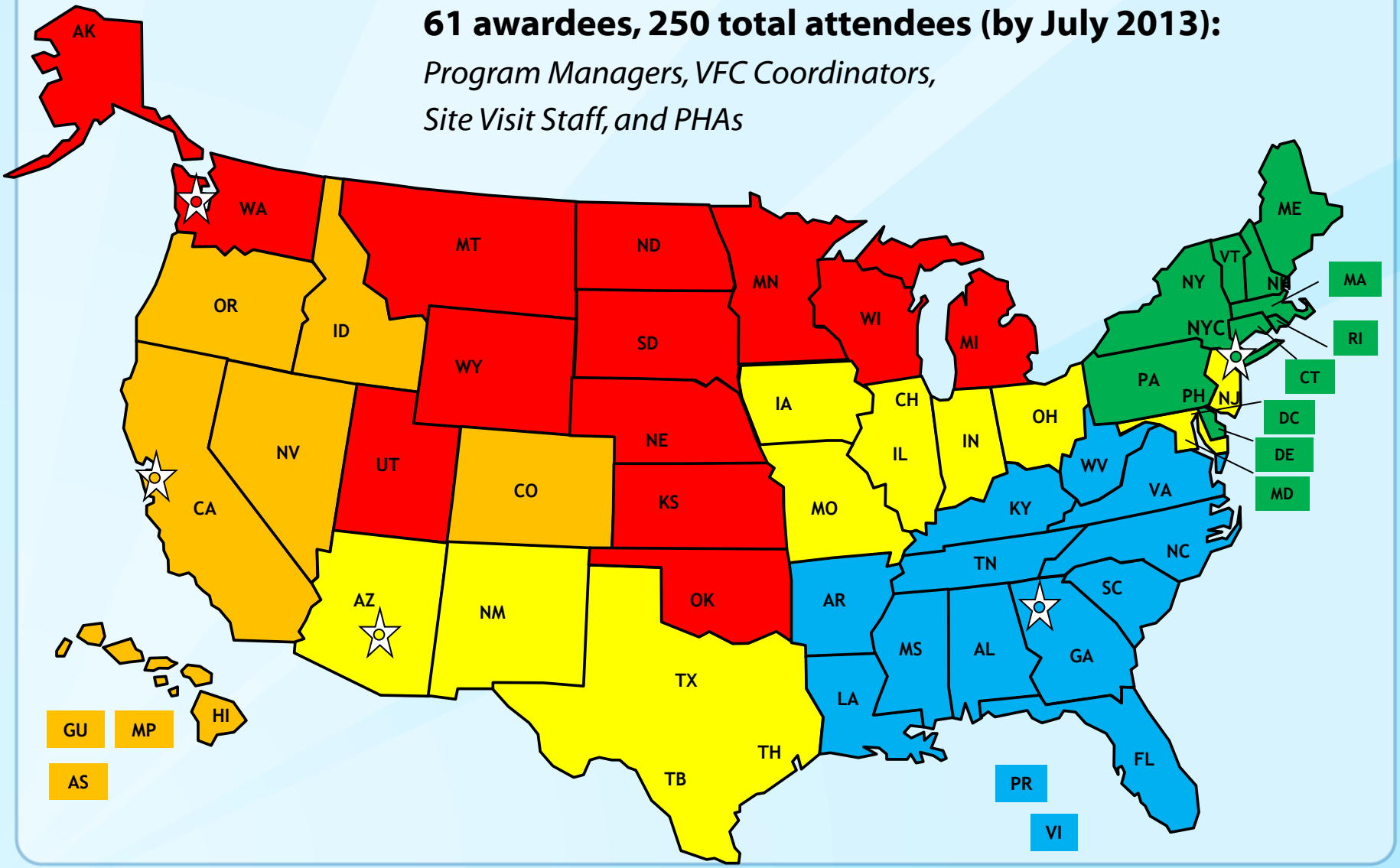
Inspector General Report

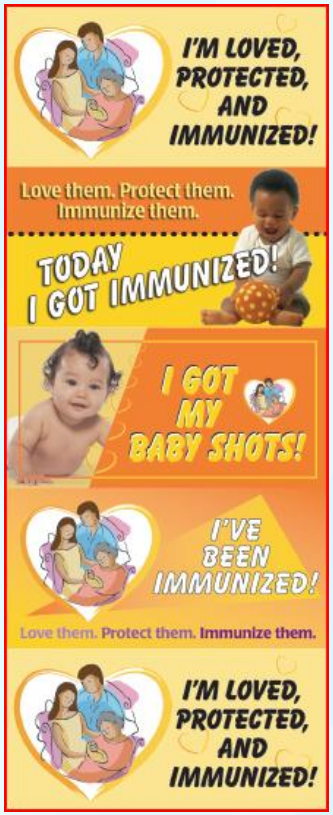
- *As part of its annual work plan, HHS Office of the Inspector General (OIG) assessed the extent to which selected Vaccines for Children (VFC) program providers and grantees adhered to CDC vaccine management requirements*
  - *Storage equipment*
  - *Vaccine management*
  - *VFC program eligibility screening*
- *OIG selected 45 VFC providers from the five largest VFC Grantees for the sample*
- *Assessments conducted in April and May of 2011*

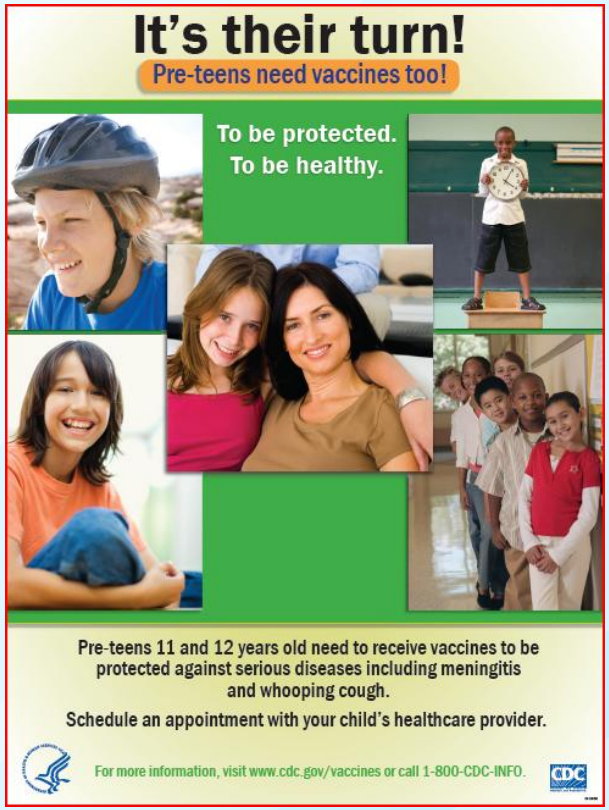
VFC in Action: Training Locations and Attendees

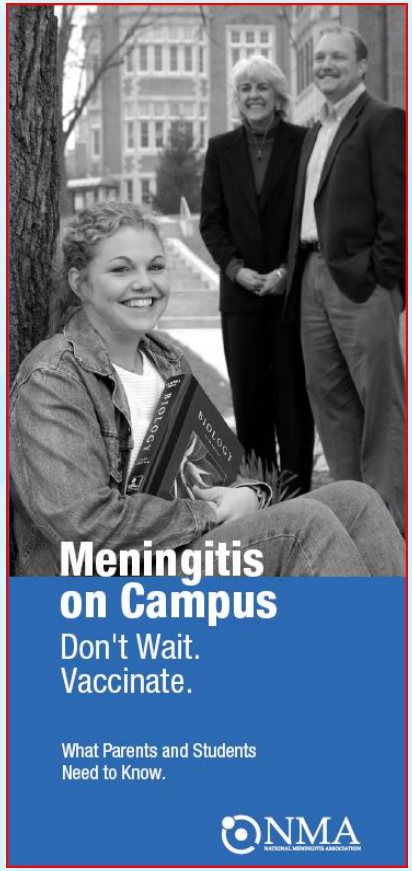
61 awardees, 250 total attendees (by July 2013):

Program Managers, VFC Coordinators, Site Visit Staff, and PHAs





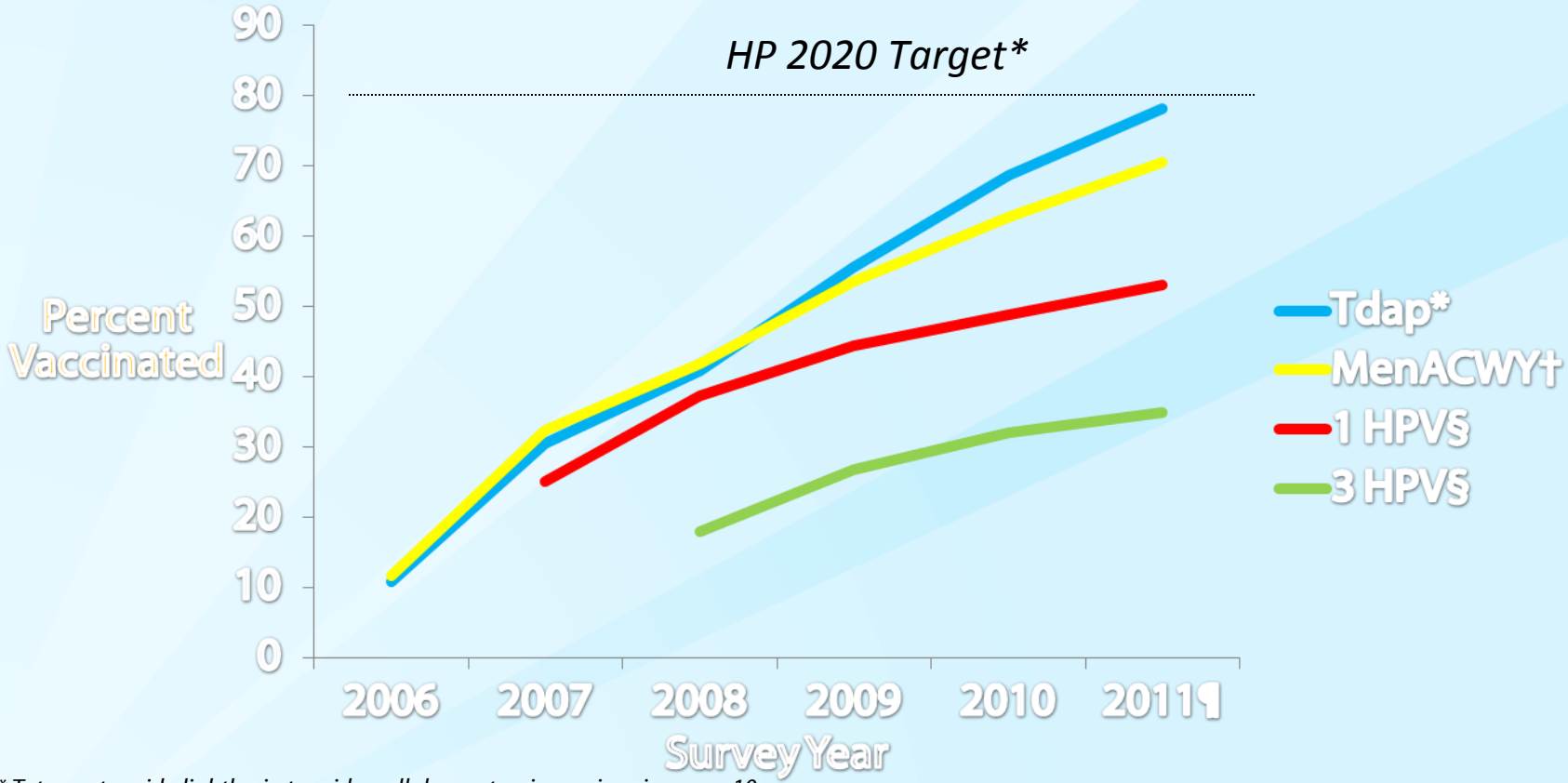




IMMUNIZATIONS FOR ADOLESCENCE

Tdap,* MenACWY,† and HPV§ vaccination estimates among adolescents, 13-17 years, NIS-Teen, United States, 2007-2011

DRAFT



** Tetanus toxoid, diphtheria toxoid, acellular pertussis vaccine since age 10*

† Meningococcal conjugate vaccine

§ Among females

¶ Dual Frame Estimates

** Target is 90 percent for two doses of varicella; ≥1 HPV is not an HP 2020 objective.*

*** Baseline for HP 2020.*

HPV: Challenges

- **Provider practices**
  - *Less likely to provide a strong recommendation for girls 11-12 years of age*
  - *Missed opportunities common*
- **Parental attitudes**
  - *Among unvaccinated girls, more than half the parents have no intent to vaccinate in the next 12 months*
  - *Main reasons include daughter not sexually active or vaccine not needed*
  - *Lack of provider recommendation and lack of school laws implies vaccine not important or needed*
- **Program challenges**
  - *Focus more on infant/childhood vaccination*
  - *Three-dose series*

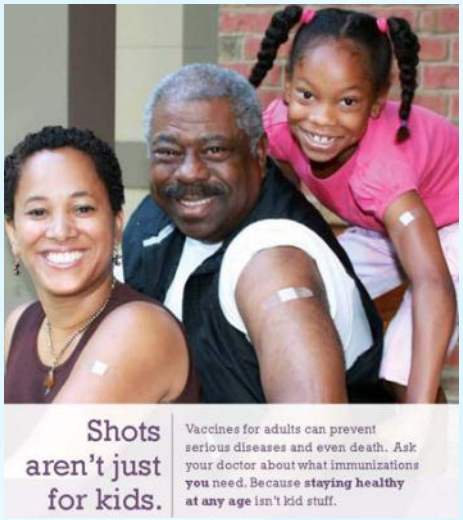
MMWR on HPV

Morbidity and Mortality Weekly Report

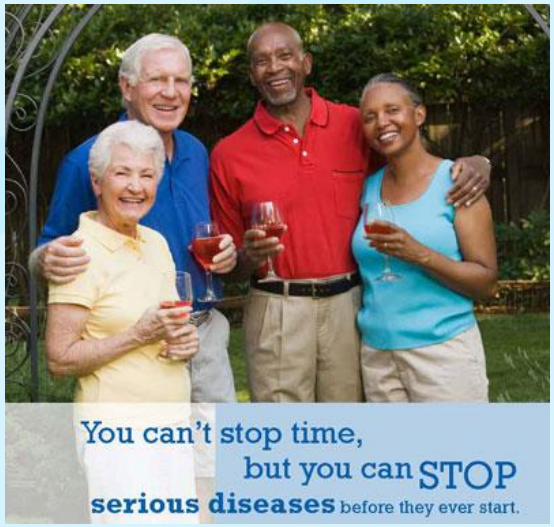
Human Papillomavirus Vaccination Coverage Among Adolescent Girls, 2007–2012, and Postlicensure Vaccine Safety Monitoring, 2006–2013 — United States

Since mid-2006, the Advisory Committee on Immunization actices (ACIP) has recommended routine vaccination of olescent girls at ages 11 or 12 years with 3 doses of human pillomavirus (HPV) vaccine (*1*). Two HPV vaccines are rrently available in the United States. Both the quadriva- nt (HPV4) and bivalent (HPV2) vaccines protect against PV types 16 and 18, which cause 70% of cervical cancers d the majority of other HPV-associated cancers; HPV4 o protects against HPV types 6 and 11, which cause 90% genital warts.* This report summarizes national HPV vac- ination coverage levels among adolescent girls aged 13–17 rs† from the 2007–2012 National Immunization Survey- postlicensure vaccine safety

After a teen's parent/guardian grants permission to contact teen's vaccination provider(s), a questionnaire is mailed t provider to obtain a vaccination history from medical reco 2012, the Council of American Survey Research Organiz (CASRO) landline response rate was 55.1%. A total of adolescents with vaccination provider–reported vacc records were included, representing 62% of all adolescer the landline sample with completed household intervie cellular telephone sample CASRO response rate was 2 total of 5,066 adolescents with vaccination provider– vaccination records were included, representing 56.4 adolescents from the cellular telephone sample with c household interviews.** Analysis for this report wa girls with provider-reported vaccination historie receipt of any HP



IMMUNIZATIONS FOR ADULTS



Recommended Adult Immunization Schedule—United States - 2013

Note: These recommendations must be read with the footnotes that follow containing number of doses, intervals between doses, and other important information.

VACCINE ▼ / AGE GROUP ►	19-21 years	22-26 years	27-49 years	50-59 years	60-64 years	≥ 65 years
Influenza [2,*]	1 dose annually					
Tetanus, diphtheria, pertussis (Td/Tdap) [3,*]	Substitute 1-time dose of Tdap for Td booster; then boost with Td every 10 yrs					
Varicella [4,*]	2 doses					
Human papillomavirus (HPV) Female [5,*]	3 doses					
Human papillomavirus (HPV) Male [5,*]	3 doses					
Zoster [6]					1 dose	
Measles, mumps, rubella (MMR) [7,*]	1 or 2 doses					
Pneumococcal polysaccharide (PPSV23) [8,9]	1 or 2 doses					1 dose
Pneumococcal 13-valent conjugate (PCV13) [10]	1 dose					
Meningococcal [11,*]	1 or more doses					
Hepatitis A [12,*]	2 doses					
Hepatitis B [13,*]	3 doses					

*Covered by the Vaccine Injury Compensation Program

For all persons in this category who meet the age requirements and who lack documentation of vaccination or have no evidence of previous infection; zoster vaccine recommended regardless of prior episode of zoster

Recommended if some other risk factor is present (e.g., on the basis of medical, occupational, lifestyle, or other indication)

No recommendation

Report all clinically significant postvaccination reactions to the Vaccine Adverse Event Reporting System (VAERS). Reporting forms and instructions on filing a VAERS report are available at www.vaers.hhs.gov or by telephone, 800-822-7967.

Information on how to file a Vaccine Injury Compensation Program claim is available at www.hrsa.gov/vaccinecompensation or by telephone, 800-338-2382. To file a claim for vaccine injury, contact the U.S. Court of Federal Claims, 717 Madison Place, N.W., Washington, D.C. 20005; telephone, 202-357-6400.

Additional information about the vaccines in this schedule, extent of available data, and contraindications for vaccination is also available at www.cdc.gov/vaccines or from the CDC-INFO Contact Center at 800-CDC-INFO (800-232-4636) in English and Spanish, 8:00 a.m. - 8:00 p.m. Eastern Time, Monday - Friday, excluding holidays.

Use of trade names and commercial sources is for identification only and does not imply endorsement by the U.S. Department of Health and Human Services.

The recommendations in this schedule were approved by the Centers for Disease Control and Prevention's (CDC) Advisory Committee on Immunization Practices (ACIP), the American Academy of Family Physicians (AAFP), the American College of Physicians (ACP), American College of Obstetricians and Gynecologists (ACOG) and American College of Nurse-Midwives (ACNM).

Burden of Disease in Adults

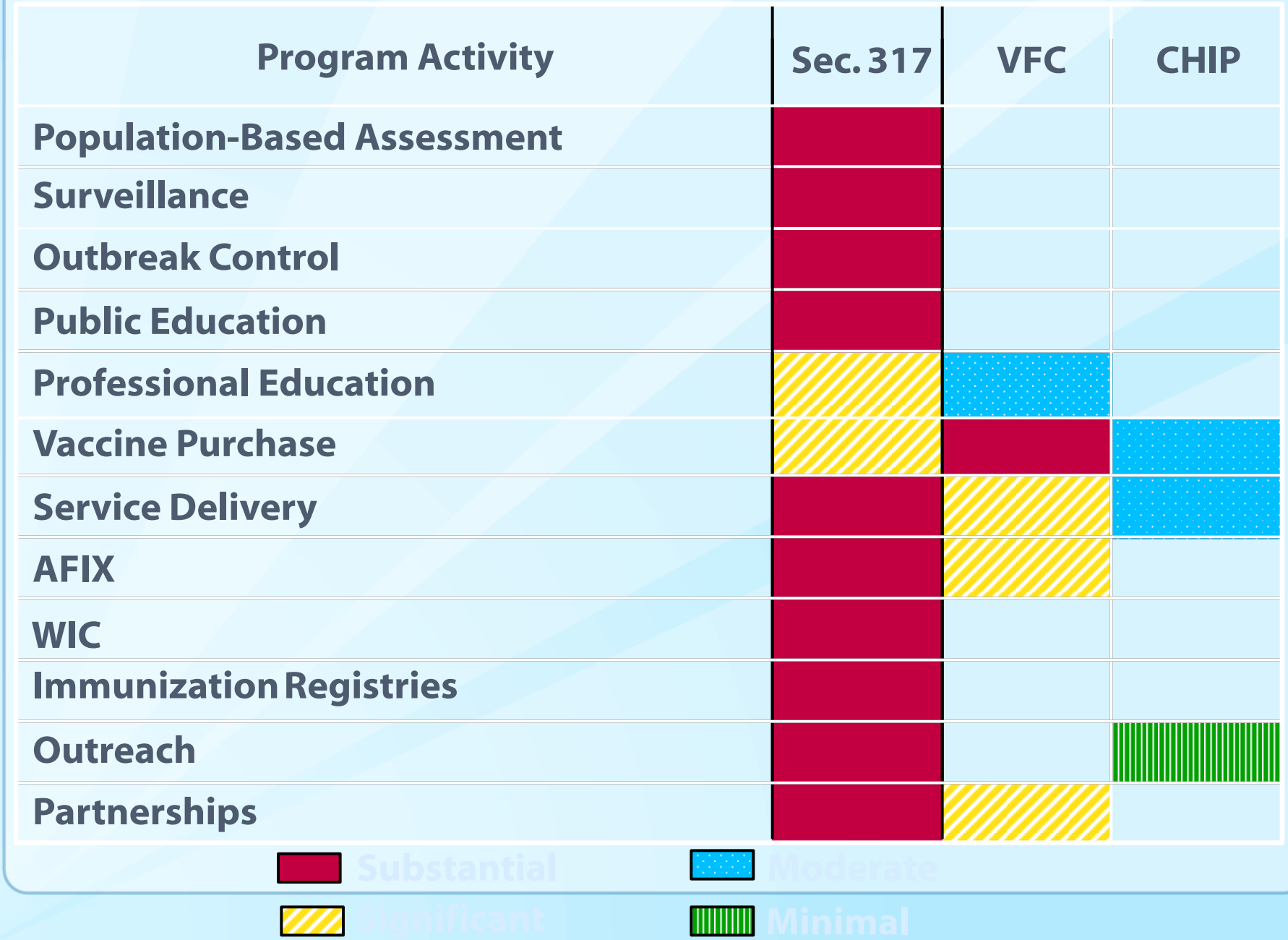
- **High burden of illness from infectious diseases among adults in the United States for which vaccines are available**
  - *From 3,000 to about 49,000 influenza-related deaths per year*
    - *~90% among adults 65 years and older*
  - *9,419 cases of acute hepatitis B in 2009*
  - *43,500 cases invasive pneumococcal disease (IPD) in 2009, including ~5,000 deaths*
    - *85% of IPD and nearly all IPD deaths among adults*
  - *Over 27,000 reported cases of pertussis in US in 2010*
    - *6,640 among adults, 4% of which are hospitalized*
  - *About 1 million cases of zoster annually U.S.*

1. *CDC. Active Bacterial Core Surveillance.* http://www.cdc.gov/abcs/reports-findings/survreports/spneu09.pdf
2. *Huang et al . Vaccine 2011*
3. *2009 NNDSS*
4. *Thompson AJPH 2009*
5. CDC. Prevention of Herpes Zoster. MMWR 2008. 57(RR-5): p. 1-30

Challenges for Vaccinating Adults

- **Dispersed/diverse sources of medical care, with less emphasis on medical home and preventive care, in part due to competing priorities**
- **Adult vaccination less integral to adult medical practices**
- **Few settings in which vaccination of adults is "required" or routinely assessed**
- **No "Vaccines for Adults" program to provide vaccine for uninsured**
  - *Fewer formal relationships between adult providers and immunizations programs*
- **High out of pocket costs deterrent for patients and providers**
  - *Even for insured persons, e.g. costs for Medicare Part D vaccines (non-flu or pneumococcal vaccines)*
- **Vaccination of adults of substantial health benefit, but lower effectiveness especially in older adults and immune compromised**

Immunization Activities by Funding Source Level of Contribution



OUR WORLD IS CHANGING…

- PATIENT PROTECTION AND AFFORDABLE CARE ACT (ACA)
- ELECTRONIC HEALTH RECORDS (EHRs)
- IMMUNIZATION INFORMATION SYSTEMS (IIS)
- INTEROPERABILITY BETWEEN EHRs AND IIS
- PUBLIC HEALTH ACCREDITATION
- BILLING CAPACITY
- WHO ARE OUR HIGHEST RISK GROUPS?
- DO WE CONTINUE TO DO OUR WORK USING THE SAME POLICIES AND PROCEDURES…?


CHANGE
AHEAD

Modernizing the Immunization Program with IT Investments

* Barcodes

Doctor's offices

E-health records

3 Focus Areas *

* VTrckS

* Interoperability

Health Departments and Immunization Information System

Modernization Efforts—
Program Areas supported by PPHF and 317

- **Interoperability*** -- *Enhance interoperability between electronic health records (EHRs) and immunization information systems (IIS) and reception of Health Level 7 (HL7) standard messages into IIS*
- **EXIS: VTrcks Interface*** -- *Develop a vaccine ordering module in an IIS that interfaces with CDC's VTrckS vaccine ordering management system*
- **Billing*** -- *Develop /implement strategic plans for billing for immunization services in health department clinics*
- **Adult-** *- Plan and implement adult immunization programs*
- **School Located Vax-** *- Enhance the sustainability of school-located vaccination*
- **Vaccine Barcode improvement – adds 2D barcode**
- **Improving vaccine management (Storage and Handling)**
- **Use of IIS to improve adolescent vaccination coverage – best practices (eg Reminder /Recall)**
- **Hepatitis B vaccination -- pilot**
- **School vaccination assessment evaluation --**
- **Use of IIS for small area analysis of coverage --**


CHANGE
AHEAD

change

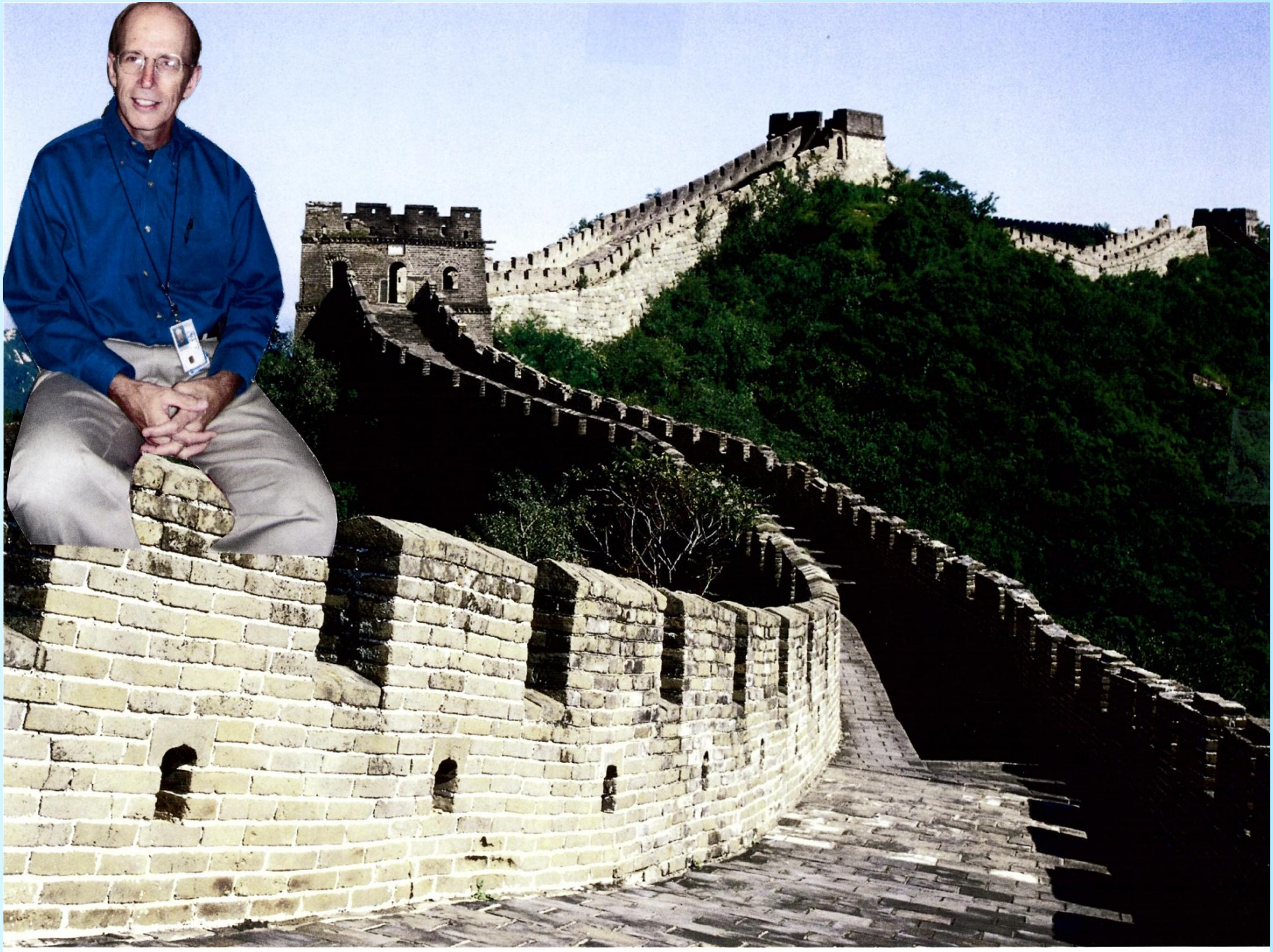
1. to make the form, nature, content, future course, etc., of (something) different from what it is or from what it would be if left alone

2. to transform or convert

3. to substitute another or others for

4. to give and take reciprocally

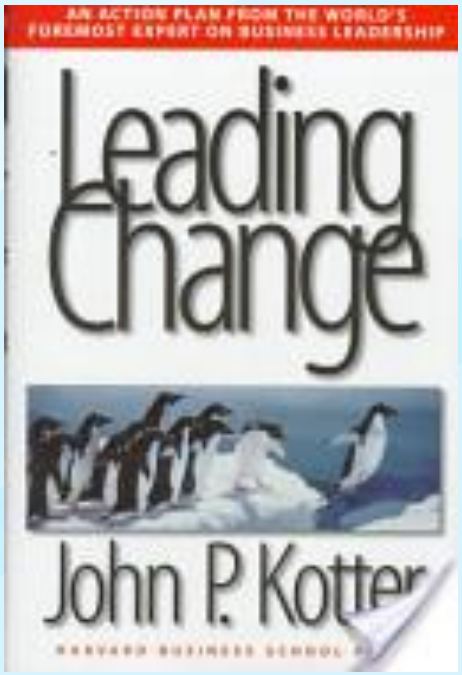
5. to transfer from one (conveyance) to another



Change

Steps to successful change

- Increase urgency
- Build the guiding team
- Get the vision right
- Communicate for buy in
- Empower action
- Create short-term wins
- Don't let up
- Make change stick



Kotter, JP. Leading Change. 1995.

Increase urgency

- Funding
- Accountability and stewardship
- Complacency

Changes that create opportunities

- Storage and handling—really understanding what makes provider sites tick, and how our requirements fit in for best impact
- Greater insurance access/coverage and impact on vaccine access
- Evolving health care delivery systems—population based (ACOs, MH), retail healthcare sites, information
- Funds targeted to impact—reduced funding can offer clarifying opportunities

Steps to successful change

- Increase urgency
- Build the guiding team
- Get the vision right
- Communicate for buy in
- Empower action
- Create short-term wins
- Don't let up
- Make change stick

Kotter, JP. Leading Change. 1995.

Building the Guiding Team—In ISD

- **Seasoned veterans**
  - *Jessie Wing, Jeanne Santoli, Gary Urquhart, Kathy Towers-Solis, Jim Singleton*
  - *Debbie Hill and Julie Locklear*
- **New leaders in the division**
  - *Brock Lamont, Program Operations Chief*
  - *Brooke Barry, Associate Director for Policy*
  - *Shannon Stokley, Associate Director for Science*
- **New recruitments**

Steps to successful change

- Increase urgency
- Build the guiding team
- **Get the vision right**
- Communicate for buy in
- Empower action
- Create short-term wins
- Don't let up
- Make change stick

Kotter, JP. Leading Change. 1995.

A Vision

- Attain highest levels of coverage for ACIP recommended vaccinations
  - Children have high coverage levels which we need to protect in the changing healthcare system
  - Adolescents and adults can be higher
- Eliminate vaccine preventable infections, and increasingly chronic disease (cancer—HPV, cancer/cirrhosis—Hepatitis)
- Identify new vaccine opportunities for development and implementation

Steps to successful change

- Increase urgency
- Build the guiding team
- Get the vision right
- Communicate for buy in
- Empower action
- Create short-term wins
- Don't let up
- Make change stick

Kotter, JP. Leading Change. 1995.

Communication for Buy In

- Policy
- Communications
- Program Operations

Steps to successful change

- Increase urgency
- Build the guiding team
- Get the vision right
- Communicate for buy in
- **Empower action**
- Create short-term wins
- Don't let up
- Make change stick

Kotter, JP. Leading Change. 1995.

Leadership Styles

Traditional	Collaborative
Top down	Self-governing
Few make decisions	Broad participation
Unilateral action	Guide & coordinate process
Win or shift power	Build relationships
Linear thinking	Systems thinking
Programs & products	Process
Charisma	Vision
Persuasive	Empathetic
Group falls apart if leader leaves	Group continues when leader leaves

Steps to successful change

- Increase urgency
- Build the guiding team
- Get the vision right
- Communicate for buy in
- Empower action
- Create short-term wins
- Don't let up
- Make change stick

Kotter, JP. Leading Change. 1995.

Short term wins

- 317 policy change on individuals with insurance
- Vaccine Tracking System (VTRCKs) deployment by May 2013
- Strategic plan requirement for Awardees -- delayed

Steps to successful change

- Increase urgency
- Build the guiding team
- Get the vision right
- Communicate for buy in
- Empower action
- Create short-term wins
- Don't let up
- Make change stick

Kotter, JP. Leading Change. 1995.

Don’t let up

- I won’t
- We won’t
- You shouldn’t

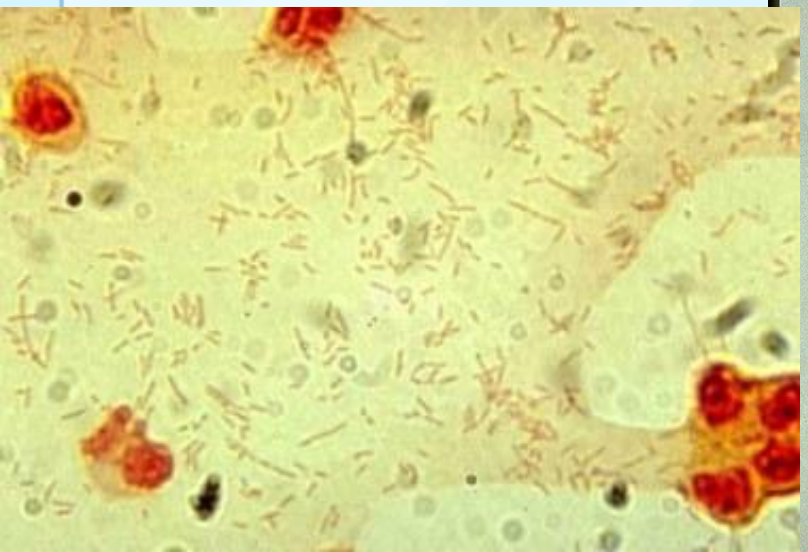
Steps to successful change

- Increase urgency
- Build the guiding team
- Get the vision right
- Communicate for buy in
- Empower action
- Create short-term wins
- Don't let up
- Make change stick

Making Change Stick—our commitments

- **Change should help us all to achieve the vision**
  - *More effectively*
  - *More efficiently*
  - *More responsibly*
- **Change will be communicated orally and in writing**
  - *Policy decisions*
  - *Program decisions*
- **Change will be collaborative**

No MORE VPDs!!




Modernization of Immunization Programs in the US
2013: 51th anniversary of the 317 Program in the US
Have a great conference
THANK YOU
for all your hard work in immunizations!

Thank you

Jessie Wing, MD, MPH

jwing@cdc.gov

The findings and conclusions in this presentation are those of the author and do not necessarily represent the official position of [the Centers for Disease Control and Prevention.

Acknowledgments

- *Chesley Richards*
- *Jim Singleton, Carla Black, Christina Dorrel*
- *Shannon Stokley*
- *Carolyn Bridges*
- *NCIRD Staff and the state/local staff and partners*

SAFER • HEALTHIER • PEOPLE

CENTERS FOR DISEASE CONTROL AND PREVENTION